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AUTHOR Winsler, Adam; De Leon, J. Rene; Carlton, Martha; Barry, Maryann J.; Jenkins, Tammy; Carter, Kermit L.

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IDENTIFIERS Draw a Line Slowly Test

ABSTRACT

This study explored the inter-relationships and developmental stability of inhibitory motor control, attentional control, delay of gratification, and resistance to temptation with 32 preschool children, and related these components of self-regulation to children's behavior at home and in the classroom. The children completed the T.O.V.A. (Greenberg & Waldman, 1993), the Cookie Delay Task (Campbell et al., 1982), the Draw-a-Line Slowly task (Maccoby et al., 1965), and a Resistance to Temptation task (Campbell et al., 1994). Parents and teachers reported on children's social skills and behavior problems, and naturalistic observations of children's behavior in the preschool classroom were conducted. The self-regulation measures showed high validity in terms of their relation with children's behavior at school, poor to modest cross-measure correlations, and modest to moderate temporal stability. In general, children who had greater self-regulation had fewer behavior problems at school, demonstrated better social skills, had more positive and frequent peer interactions at school, and engaged more often in on-task classroom activities. Laboratory measures were more strongly related to children's classroom behavior than behavior at home and most relations observed strengthened with age. (Author/JPB)

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Components of Self Regulation in the Preschool Years: Developmental Stability, Validity, and Relationship to Classroom Behavior

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Adam Winsler
J. René De León
Martha Carlton
Maryann J. Barry
Tammy Jenkins
Kermit L. Carter

University of Alabama

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Correspondence should be addressed to Adam Winsler, Department of Psychology - 3F5, George Mason University, Fairfax, VA. 22030-4444. PHONE: (703) 993-1881, EMAIL: awinsler@gmu.edu

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ABSTRACT

The present study explored the inter-relationships and developmental stability of inhibitory motor control, attentional control, delay of gratification, and resistance to temptation in a nonclinical sample of preschool children, and related these components of self-regulation to children's behavior at home and in the classroom. 32 preschool children completed the T.O.V.A., the Cookie Delay task, the Draw-a-Line Slowly task, and a Resistance to Temptation task. Parents and teachers reported on children's social skills and behavior problems, and naturalistic observations of children's behavior in the preschool classroom were conducted. Overall, the self-regulation measures showed high validity in terms of their relation with children's behavior at school, poor to modest cross-measure correlations, and modest to moderate temporal stability. In general, children who waited until the bell to eat the cookie, refrained from touching the forbidden toy, slowed themselves down in the pencil and paper task, and sustained their attention and vigilance on the computer task a) had fewer behavior problems at school, b) demonstrated better social skills, c) had more positive and frequent peer interactions at school, and d) engaged more often in on-task classroom activities for longer periods of time. Laboratory measures were more strongly related to children's classroom behavior than behavior at home and most relations observed strengthened with age.

INTRODUCTION / RATIONALE

- Major developments take place in children's ability to regulate their own behavior during the preschool years.

- Little is currently known about the specific pathways, component processes, and influences involved in self-regulatory development and this is likely due to the fact that self-regulation, a complex and multidimensional construct, has been notoriously difficult to measure.

- Investigators have typically studied individual components of the larger construct of self-regulation in isolation, such as inhibitory or impulse control, delay of gratification, compliance, self-control, resistance to temptation, internalization, cognitive tempo, and impulsivity.

- Although encouraging progress has recently been made in measuring both inhibitory control in young toddlers (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996), and impulsivity in school age children (Kindlon, Mezzacappa, & Earls, 1995), much remains to be learned about the relationships between various components of self-regulation, how they change developmentally during the preschool years, and what their significance is for children's adaptive functioning.

- The present study explored the inter-relationships and developmental stability of inhibitory motor control, attentional control, delay of gratification, and resistance to temptation in a nonclinical sample of preschool children, and related these components of self-regulation to children's behavior at home and in the classroom.

METHOD

SUBJECTS

- *32 Preschool Children*
  - Wide range of SES, 47% Male,
  - 72% White, 12% African-American, 16% Asian-American

- 16 - Three-Year Old Classroom
  - Time 1 (Beginning of School Year) — Age M = 43.6 months
  - Time 2 (End of School Year) — Age M = 50.0 months

- 16 - Four-Year-Old Classroom
  - Time 1 (Beginning of School Year) — Age M = 55.1 months
  - Time 2 (End of School Year) — Age M = 59.7 months

LABORATORY MEASURES

- **Attentional Control** (T.O.V.A. - Greenberg & Waldman, 1993)

Computerized Nonverbal Continuous Performance Task - produces the following scores:

- Omission Errors (inattention)
- Commission Errors (impulsivity)
- Percentage Correct (accuracy)
- Total Time Focused on Task (vigilance)
  [Coded from videotapes as the number of seconds child's gaze was focused on computer screen or input device]

- **Delay of Gratification** (Cookie Delay Task - Campbell et al., 1982)

- Number of Seconds Waited
- Number of Successful Trials (no touches)

- **Motor Inhibition** (Draw-a-Line Slowly - DAL - Maccoby et al., 1965)

- Number of Seconds Child Slowed Down Motor Behavior

- **Resistance to Temptation** (Train Delay - Campbell et al., 1994)

- Number of Seconds Waited
- Number to Forbidden Touches

METHOD (Continued)

OTHER MEASURES

- **Children's Behavior in the Classroom - Teacher Report**
  Preschool & Kindergarten Behavior Scales (PKBS - Merrell, 1994)
  - Social Skills
  - Externalizing Behavior
  - Internalizing Behavior Problems
  - Total Behavior Problems

- **Children's Behavior in the Home - Parental Report**
  Preschool & Kindergarten Behavior Scales (PKBS - Merrell, 1994)
  - Social Skills
  - Externalizing Behavior
  - Internalizing Behavior Problems
  - Total Behavior Problems

NATURALISTIC CLASSROOM OBSERVATIONS (n = 2752)

Time-Sampling Observation Method:

- **Each child - approximately 10 observations:**
  - **10, 10 minute observation sets**
    - **each set:**
      - **10, 10-sec periods of direct observation separated by 50-second intervals.**

- **Behavioral Observation Checklist Instrument**

METHOD (Continued)

NATURALISTIC OBSERVATION - VARIABLES:

Classroom

3 Year Old 4 Year Old

Classroom Context (Reliability = 100%)

Large Group Activity (LGA)

Self-Selected Activity (SSA)

Outside Recess (OR)

Behavior

1) On-Task vs. Off-Task (Reliability = 81%)

2) Appropriate vs. Inappropriate (Reliability = 100%)

3) New Activity vs. Sustained Activity (Reliability = 93%)

Affect (Reliability = 80%)

Positive Neutral Negative

Social Context (Reliability = 87%)

Alone With Peer(s)

With Teacher(s) Both (Teacher & Peer)

Speech (Reliability = 73%)

None Social

Private Both (Private & Social)

RESULTS

1) Overall, the self-regulation measures showed high validity in terms of their relations with children's behavior at school, poor to modest cross-measure correlations, and modest to moderate temporal stability.

2) Inhibitory motor control (DAL) showed reasonable stability over time (.63); was positively correlated with social skills (.48) and peer interaction in the classroom (.56); was negatively associated with private speech (-.53), teacher presence in the classroom (-.50), and internalizing behavior problems at school (-.54); but was unrelated to the other self-regulation measures.

3) Delay of gratification (Cookie) showed relatively low developmental stability (.36); was positively related to children's peer interaction (.51) and positive affect in the classroom (.59); was negatively related to internalizing behavior problems at school (-.44) and teacher presence in the classroom (-.50); and was related only to vigilance on the T.O.V.A. (.60).

4) Resistance to temptation was reasonably stable over time (.75); positively related to social skills (.40), positive affect (.58), and on-task behavior (.43) in the classroom; negatively related to externalizing behavior problems (-.51); and correlated only with attention on the T.O.V.A. (.48).

RESULTS (Continued)

5) Attentional control (T.O.V.A.) was moderately stable over time (.50); positively related to sustained activity (.49), on-task activity (.51), social skills (.67), and positive affect (.61) in the classroom; negatively related to private speech use (-.52), and both externalizing (-.77) and internalizing behavior problems (-.64) at school.

6) The above relationships were generally stronger for older children and children at Time 2.

7) Age was significantly associated with performance on the motor inhibition and resistance to temptation tasks but not the other tasks of self regulation.

8) Few relationships were found between performance on the laboratory self-regulation tasks and children's reported behavior at home.

9) Children's performance on the self-regulation measures mostly improved from Time 1 to Time 2.

10) Preschool teachers reported boys as having more externalizing behavior problems than girls, and girls showed better attention and accuracy on the TOVA and better motor inhibition than boys. However, there were no gender differences on the other self-regulation measures.

CONCLUSIONS

1) Children's behavioral self-regulation, as measured in the laboratory, is significantly related to behavior and social interactions in the preschool classroom.

2) In general, children who waited until the bell to eat the cookie, refrained from touching the forbidden toy, slowed themselves down in the pencil and paper task, and sustained their attention and vigilance on the computer task a) had fewer behavior problems at school, b) demonstrated better social skills, c) had more positive and frequent peer interactions at school, and d) engaged more often in on-task classroom activities and for longer periods of time.

3) The four components of self regulation studied here (attentional control, motor inhibition, delay of gratification, and resistance to temptation) appear to contribute unique variance in predicting children's classroom behavior.

Correlations Within and Between Self-Regulation Tasks - Time 1 and Time 2

(NOTE: Time 1 in lower left, Time 2 in upper right, Test-Retest in Diagonal)

	Resistance		Delay		Inhibition	Attentional Control			
	Secs Waited	(n) Touch	Trials	Secs Waited	Slowed Down	Omit Errors	Commit Errors	% Correct	Total Time
Resistance Task									
• Number of Seconds Waited	.26	**-.78***	.12	.14	-.13	**-.48***	.17	.28	.11
• Number of Forbidden Touches	**-.69***	**.75***	-.26	-.38	.11	**.48***	-.04	-.30	-.32
Delay Task									
• Number of Successful Trials	.16	-.24	.27	**.93***	-.12	-.30	.28	.44	**.58***
• Number of Seconds Waited	.04	-.13	**.89***	.36	-.10	-.45	-.49	.49	**.60***
Motor Inhibition Task									
• Degree Slowed Down	-.21	.23	.19	.12	**.63***	-.17	.10	.26	.25
Attentional Control Task									
• Omission Errors	-.06	.37	-.11	-.11	-.27	.46	-.04	**-.89***	**-.64***
• Commission Errors	.41	-.28	.06	.06	.26	.06	.03	-.09	.28
• Percentage Correct	-.11	-.25	.11	.11	.22	**-.94***	-.31	.46	**.66***
• Total Time On Task	.19	-.26	.04	.04	-.05	-.44	.06	.42	.50

Correlations Between Motor Inhibition and Children's Social Skills/Behavior at Home and at School, at Time 1 and Time 2

TIME 1 (Age M = 49.5 yrs, SD = 6.9)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Motor Inhibition (Degree slowed down)	.22	.30	.10	-.09	-.23	-.41	.05	-.21

TIME 2 (Age M = 55.3 yrs, SD = 6.2)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Motor Inhibition (Degree slowed down)	.15	**.48***	-.03	-.29	.29	**-.54***	.14	**-.40***

Correlations Between Delay of Gratification and Children's Social Skills/Behavior at Home and at School, at Time 1 and Time 2

TIME 1 (Age M = 49.5 yrs, SD = 6.9)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Number of Successful Trials (No touches until bell)	.12	.34	-.08	-.26	-.31	**-.44***	-.16	-.35
Number of Seconds Waited	.26	.21	-.14	-.21	-.29	-.27	-.21	-.25

TIME 2 (Age M = 55.3 yrs, SD = 6.2)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Number of Successful Trials (No touches until bell)	.08	.10	-.05	-.17	-.10	-.06	-.08	-.14
Number of Seconds Waited	.29	.13	.03	-.10	.01	.02	.03	-.06

Correlations Between Resistance to Temptation and Children's Social Skills/Behavior at Home and at School, at Time 1 and Time 2

TIME 1 (Age M = 49.5 yrs, SD = 6.9)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Number of Seconds Waited	.03	.35	-.18	**-.45***	-.28	-.23	-.24	**-.41***
Number of Forbidden Touches	.07	-.37	.18	**.51***	.34	.15	.26	**.41***

TIME 2 (Age M = 55.3 yrs, SD = 6.2)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Number of Seconds Waited	-.16	.29	-.09	**-.45***	.03	-.06	-.07	-.34
Number of Forbidden Touches	.06	**-.40***	.11	**.51***	.11	.11	.14	.39

Correlations Between T.O.V.A. Measures and Children's Social Skills/Behavior at Home and at School, at Time 1 and Time 2

TIME 1 (Age M = 49.5 yrs, SD = 6.9)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Omission Errors (Inattention)	-.11	.19	.37	.22	.09	-.17	.33	.08
Commission Errors (Impulsivity)	.20	.15	-.22	-.27	-.38	-.08	-.29	-.21
Percentage Correct	.05	-.17	-.26	-.16	.15	.09	-.19	-.07
Total Time on Task (Vigilance)	-.23	.44	**-.56***	**-.77***	.06	**-.53***	-.41	**-.72***

TIME 2 (Age M = 55.3, SD = 6.2)

	Social Skills		*Externalizing Behavior Problems*		*Internalizing Behavior Problems*		*Total Behavior Problems*	
	Home	School	Home	School	Home	School	Home	School
Omission Errors (Inattention)	-.23	**-.67***	**.58***	**.72***	.14	**.64***	**.50***	**.73***
Commission Errors (Impulsivity)	.02	.12	-.16	-.09	-.08	.07	-.14	-.07
Percentage Correct	.25	**.64***	-.40	**-.61***	-.05	**-.62***	-.33	**-.64***
Total Time on Task (Vigilance)	.05	.34	-.24	-.29	.15	-.26	-.15	-.30

Correlations Between Self-Regulation Measures and Children's Observed Classroom Behavior - Time 1

	Activity		Social Interaction				Affect			Speech	
	On-Task Behavior	Sustained Activity	Alone	Peer(s)	Teacher	Peer(s) & Teacher	Negative Affect	Neutral Affect	Positive Affect	Social Speech	Private Speech
Resistance Task											
• Number of Seconds Waited	.14	-.03	.08	.06	.08	-.17	-.30	-.11	.17	.14	-.14
• Number of Forbidden Touches	-.39	-.08	.07	-.25	-.03	.27	**.49***	.32	-.39	.02	.25
Delay Task											
• Number of Successful Trials	.07	-.19	-.03	**.49***	-.19	**-.43***	**-.56***	-.07	.18	-.23	-.13
• Number of Seconds Waited	.06	-.27	.08	**.51***	-.23	**-.50***	**-.59***	-.20	.29	-.31	.08
Motor Inhibition Task											
• Degree Slowed Down	.31	.24	-.10	.08	-.26	.12	-.20	.22	-.16	-.24	**-.53***
Attentional Control Task											
• Omission Errors	.08	-.07	.15	.20	-.35	-.09	.33	**.59***	**-.61***	-.23	-.19
• Commission Errors	.35	.41	-.34	-.23	.22	.36	.35	.10	-.14	.28	.02
• Percentage Correct	-.09	.04	-.04	.00	.10	-.05	-.34	**-.55***	**.57***	.07	.21
• Total Time On Task	.07	.25	-.12	.40	.04	-.40	.09	-.09	.08	.26	-.07

Correlations Between Self Regulation Measures and Children's Observed Classroom Behavior - Time 2

	Activity		Social Interaction				Affect			Speech	
	On-Task Behavior	Sustained Activity	Alone	Peer(s)	Teacher	Peer(s) & Teacher	Negative Affect	Neutral Affect	Positive Affect	Social Speech	Private Speech
Resistance Task											
• Number of Seconds Waited	.37	.07	-.11	.21	.02	-.20	-.37	**-.43***	**.46***	-.03	-.17
• Number of Forbidden Touches	**-.43***	-.02	-.01	-.34	.10	.34	**.59***	**.52***	**-.58***	.19	.25
Delay Task											
• Number of Successful Trials	.07	-.07	-.02	.36	-.21	-.29	-.22	-.23	.25	-.28	-.03
• Number of Seconds Waited	.18	.01	-.02	.32	-.22	-.23	-.35	-.36	**.40***	-.25	-.00
Motor Inhibition Task											
• Degree Slowed Down	.37	.17	.06	**.56***	**-.50***	-.38	-.27	-.00	.05	**-.49***	-.39
Attentional Control Task											
• Omission Errors	**-.51***	**-.49***	.21	-.31	.01	.22	.43	.37	-.41	-.20	**.52***
• Commission Errors	-.12	-.14	-.09	-.07	.40	-.11	-.11	-.08	.09	.05	-.09
• Percentage Correct	**.47***	**.47***	-.15	.43	-.32	-.21	-.25	-.34	.34	-.03	**-.50***
• Total Time On Task	.08	.12	-.02	.22	-.04	-.21	-.28	-.32	.34	-.03	-.33